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HOLLOW YARN MOLD MODULE

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[There are no amendments to this patent.]

Claims

1. A type of hollow yarn mold module characterized by the following facts: the hollow yarn mold module has multiple hollow yarns which have the upper portion opened and lower portion closed, fixed with an adhesive at the upper and lower ends; gas feeding tubes that go through a lower bonding and fixing portion and have two ends opened are buried as they are dispersed in the bundle of the hollow yarns.

2. A type of hollow yarn mold module characterized by the following facts: the hollow yarn mold module has multiple hollow yarns, which have the upper portion opened and lower portion closed, fixed with an adhesive at the upper and lower ends; gas feeding tubes that go through a lower bonding and fixing portion and have two ends opened are buried as they are dispersed in the bundle of the hollow yarns; also, isolating tubes, which have at least one end

closed in the upper bonding and fixing portion, are buried as they are dispersed in the bundle of the hollow yarns.

Detailed explanation of the invention

Industrial application field

The present invention pertains to a type of hollow yarn mold module that can be used in filtering feedwater containing contaminants using an external pressing method and can easily remove colloids and other contaminants attached on the outer surfaces of the hollow yarns.

Prior art and problems to be solved by the invention

When feedwater containing metal colloids and other colloid-like substances is filtered using an external pressing method by means of a hollow yarn mold module, colloids and other contaminants are attached on the outer surfaces of the hollow yarns. Consequently, the filtering rate decreases gradually, and the lifetime of the hollow yarns also becomes shorter. This is undesired. Although backwashing or the like has been proposed to remove colloids, etc., attached on the outer surfaces of the hollow yarns, the effects are insufficient.

In order to solve this problem, the present inventors have proposed the following scheme: in the bonding and fixing portion that bonds and fixes the hollow yarn bundle in the lower portion of the hollow yarn mold module, slits are formed through the bonding and fixing portion. When the filtering water flow rate decreases, a gas or a fluid containing the gas is fed through the slits into the bonding and fixing portion to remove the colloid substances attached on the hollow yarns. However, in this scheme, although it is easy to remove colloids, etc., when the slits are formed, the hollow yarns are prone to damage. Also, when the number of slits is small, only the colloid substances attached on the hollow yarns near the slits can be removed. On the other hand, when the number of slits is large, the operation becomes complicated. This is also undesirable.

Purpose of the invention

The purpose of this invention is to solve the aforementioned problems of the conventional methods by providing a type of hollow yarn mold module characterized by the fact that it can effectively remove colloids and other contaminants attached on the hollow yarns in a simple way.

Constitution of the invention

This invention provides a type of hollow yarn mold module characterized by the following facts: the hollow yarn mold module has multiple hollow yarns, which have an upper portion opened and lower portion closed, fixed with an adhesive at the upper and lower ends; gas

feeding tubes that go through a lower bonding and fixing portion and have two ends opened are buried as they are dispersed in the bundle of the hollow yarns.

Embodiment

In the following, the hollow yarn mold module of this invention will be explained with reference to figures.

Figures 1-3 illustrate an example of the hollow yarn mold module of this invention. A hollow yarn bundle has its upper/lower ends fixed with an adhesive in housing (1). Each hollow yarn (2) has its upper end opened and lower end closed. The upper end is fixed at upper bonding and fixing portion (3), and the lower end is fixed at lower bonding and fixing portion (3). In lower bonding and fixing portion (3), multiple gas feeding tubes (5), which go through the fixing portion, are longer than the thickness of the bonding and fixing portion and have the openings [illegible] closed, are buried and dispersed in the hollow yarn bundle (Figure 2). On the other hand, in upper bonding and fixing portion (3), isolating tubes (4) prepared from hollow yarns having both ends or one end closed are buried and dispersed in the hollow yarn bundle (Figure 3).

The feedwater fed through feedwater inlet (8) into the module enters the outer side of hollow yarns (2) in the housing. Colloids and other contaminants contained in the feedwater remain on the outer side of hollow yarns (2), while the filtered clean water which passed through the wall of the hollow yarns is exhausted through the upper bonding and fixing portion and is exhausted from filtered water outlet (7).

As colloids, etc., are gradually attached on the outer wall of the hollow yarns, the filtering efficiency decreases. In this case, feeding of the feedwater is stopped, and gas or a fluid containing gas is fed in through gas feeding tubes (5). By means of the fed-in gas, colloids and other contaminants are separated from the hollow yarn wall so that the activity of the hollow yarns is recovered. After the fed-in gas removes the contaminants, it is collected to the lower portion of the upper bonding and fixing portion. In addition, as isolating tubes (4) are buried dispersed in upper bonding and fixing portion (3), the various hollow yarns are separated from each other with a sufficient spacing. Consequently, the fed-in gas can rise and flow uniformly in the hollow yarn bundle. As a result, the removal performance is further improved. Because isolating tubes (4) have both ends or one end closed, no gas can enter the filtered water, and the contaminants removed from the wall of the hollow yarns are removed from colloid-removing outlet (9), while the gas is exhausted and removed from gas vent (8). After recovery of the activity of the hollow yarns, filtering is restarted.

As far as the size of the gas feeding tubes is concerned, the inner diameter is preferably in the range of 0.1-10 mm. If the inner diameter is smaller than 0.1 mm, the quantity of the gas or

the fluid containing the gas fed through the gas feeding tubes becomes insufficient. Consequently, colloids, etc., attached on the outer surface of the hollow yarns cannot be sufficiently removed. On the other hand, if the inner diameter is larger than 10 mm, the fed-in gas is not well dispersed, or the number of the hollow yarns becomes too small, leading to a decrease in the filtering efficiency. This is undesirable.

The length of the gas feeding tubes can be adjusted at will to ensure good feeding-in of the gas. The number of the gas feeding tubes depends on the diameter of the gas feeding tubes and the diameter of the module in use. Although a larger number of gas feeding tubes can effectively remove colloids, etc., the surface area of the hollow yarns nevertheless becomes smaller. Consequently, it should be selected appropriately.

Effect of the invention

The hollow yarn mold module of this invention can remove contaminants easily and at a high filtering efficiency.

Brief description of the figures

Figure 1 is a schematic cross-sectional view illustrating the hollow yarn mold module of this invention.

Figure 2 is a cross-sectional view taken across A-A' in Figure 1. It illustrates the relationship between the gas feeding tubes and the hollow yarns in a schematic enlarged view.

Figure 3 is a cross-sectional view taken across B-B' in Figure 1. It illustrates the relationship between the hollow yarns and the isolating tubes in a schematic enlarged view.

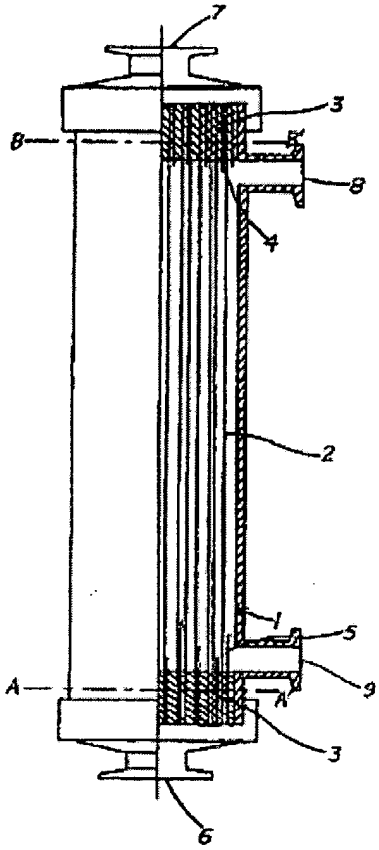

Figure 1

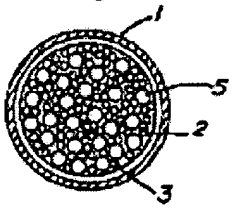

Figure 2

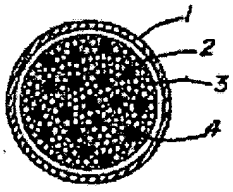

Figure 3